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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/626,630 | 07/25/2003 | David Keith Bowen | 032516-003 | 9628 |

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| EXAMINER | |
|---|---|
| HO, ALLEN C | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2882 | |

DATE MAILED: 01/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/626,630 | BOWEN ET AL. | |
| | Examiner | Art Unit | |
| | Allen C. Ho | 2882 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *25 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *012004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Kariya *et al.* (U. S. Patent No. 5,164,974).

With regard to claims 1-3, Kariya *et al.* disclosed a Soller slit device for collimating high energy radiation comprising: a plurality of substantially parallel blades made from glass (column 16, lines 16-21).

3. Claims 1, 2, and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Otto *et al.* (J. Appl. Cryst. **29** (1996), 495-497).

With regard to claims 1, 2, and 4, Otto *et al.* disclosed a Soller slit device for collimating high energy radiation comprising: a plurality of substantially parallel blades made from mica (p. 496, column 2, lines 17-26).

*Claim Rejections - 35 USC § 103*

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 5-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kariya *et al.* (U. S. Patent No. 5,164,974) as applied to claim 1 above.

With regard to claims 5 and 6, Kariya *et al.* disclosed the Soller slit device of claim 1. However, Kariya *et al.* failed to teach that the device transmits at least 60% of incident high energy radiation.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the Soller slit device to transmit at least 60% of incident high energy radiation, since a person would be motivated to shorten the time to expose the wafer by increasing the incident radiation on the wafer.

With regard to claims 7-11, Kariya *et al.* disclosed the Soller slit device of claim 1. However, Kariya *et al.* failed to teach that the device comprises blades having the length and the thickness as claimed.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide blades having the length and the thickness as claimed, since a person would be motivated to use a Soller slit device that has the characteristics demanded by engineering requirements.

6. Claims 5-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Otto *et al.* (J. Appl. Cryst. **29** (1996), 495-497) as applied to claim 1 above.

With regard to claims 5 and 6, Otto *et al.* disclosed the Soller slit device of claim 1. However, Otto *et al.* failed to teach that the device transmits at least 60% of incident high energy radiation.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the high-energy collimating device such that it has a transmission efficiency of at least 60%, since a person would be motivated to increase the signal-to-noise ratio by increasing the intensity of the x-ray beam used to analyze the sample.

With regard to claims 7-11, Otto *et al.* disclosed the Soller slit device of claim 1. However, Otto *et al.* failed to teach that the device comprises blades having the length and the thickness as claimed.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide blades having the length and the thickness as claimed, since a person would be motivated to use a Soller slit device that has the characteristics required by the measurements.

7. Claims 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Otto *et al.* (J. Appl. Cryst. **29** (1996), 495-497) as applied to claim 1 above, and further in view of Fujinawa *et al.* (U. S. Patent No. 6,266,392 B1).

With regard to claims 12-15, Otto *et al.* disclosed the Soller slit device of claim 1. However, Otto *et al.* failed to teach that the surface of each of the blades is non-reflective to high energy radiation.

Fujinawa *et al.* disclosed a Soller slit device having non-reflective blades (column 1, line 45 - column 3, line 32). Funinawa *et al.* taught by providing non-reflective blades, it is possible to form high precision parallel x-ray beams, thereby the resolution in the x-ray measurement is improved (column 2, lines 47-51).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide non-reflective blades, since a person would be motivated to improve the resolution of measurements.

8. Claims 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujinawa *et al.* (U. S. Patent No. 6,266,392 B1).

With regard to claims 16-19, Fujinawa *et al.* disclosed a system for performing high-energy radiation diffractometer, comprising: a high energy radiation source (F); a high-energy radiation collimating device (**6**); and a device (**1**) for collecting high-energy radiation after the high energy radiation impinges on a sample (S) to be examined.

However, Fujinawa *et al.* failed to teach that the high-energy collimating device has a divergence angle of less than 0.1 ° and a transmission efficiency of at least 60%.

Fujinawa *et al.* taught that the high-energy collimating device (Sollar slits) has a divergence angle given by:

$$\phi = 2 \tan^{-1}(t/L) \approx 2t/L \text{ for small } \phi$$

where L is a length of the metal foil (**9**) and t is a gap between adjacent foils. The divergence angle defines the resolution of the x-ray optical system utilizing the Sollar slits (column 4, lines 57-65).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the high-energy collimating device such that it has a divergence angle of less than 0.1 °, since a person would be motivated to analyze small objects by reducing the resolution of the x-ray optical system.

Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the high-energy collimating device such that it has a transmission efficiency of at least 60%, since a person would be motivated to increase the signal-to-noise ratio by increasing the intensity of the x-ray beam used to analyze the sample.

9. Claims 16-20 and 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Otto *et al.* (J. Appl. Cryst. **29** (1996), 495-497) in view of Fujinawa *et al.* (U. S. Patent No. 6,266,392 B1).

With regard to claims 16-20 and 22, Otto *et al.* disclosed a system for performing high energy radiation diffractometry, comprising: a high energy radiation source (x-ray tube); a Soller slit device comprising blades made from mica (p. 496, column 2, lines 17-26); and a device (IP) for collecting high energy radiation after the high energy radiation impinges on a sample (S) to be examined.

However, Otto *et al.* failed to teach that the high-energy collimating device has a divergence angle of less than 0.1 ° and a transmission efficiency of at least 60%.

Fujinawa *et al.* taught that the high-energy collimating device (Sollar slits) has a divergence angle given by:

$$\phi = 2 \tan^{-1}(t/L) \approx 2t/L \text{ for small } \phi$$

where L is a length of the metal foil (**9**) and t is a gap between adjacent foils. The divergence angle defines the resolution of the x-ray optical system utilizing the Sollar slits (column 4, lines 57-65).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the high-energy collimating device such that it has a divergence angle of less than 0.1 °, since a person would be motivated to analyze small objects by reducing the resolution of the x-ray optical system.

Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the high-energy collimating device such that it has a transmission efficiency of at least 60%, since a person would be motivated to increase the signal-to-noise ratio by increasing the intensity of the x-ray beam used to analyze the sample.

10. Claims 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkins (U. S. Patent No. 5,016,267) in view of Fujinawa *et al.* (U. S. Patent No. 6,266,392 B1).

With regard to claims 16-21, Wilkins disclosed a system for performing high energy radiation diffractometry, comprising: a high energy radiation source; a Soller slit device (**10**) comprising blades (micro-channel plates) made from glass (column 6, lines 32-35); and a device (detector) for collecting high energy radiation after the high energy radiation impinges on a sample to be examined (column 2, lines 3-6).

However, Wilkins failed to teach that the high-energy collimating device has a divergence angle of less than 0.1 ° and a transmission efficiency of at least 60%.

Fujinawa *et al.* taught that the high-energy collimating device (Sollar slits) has a divergence angle given by:

$$\phi = 2 \tan^{-1}(t/L) \approx 2t/L \text{ for small } \phi$$

where L is a length of the metal foil (**9**) and t is a gap between adjacent foils. The divergence angle defines the resolution of the x-ray optical system utilizing the Sollar slits (column 4, lines 57-65).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the high-energy collimating device such that it has a divergence angle of less than 0.1 °, since a person would be motivated to analyze small objects by reducing the resolution of the x-ray optical system.

Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the high-energy collimating device such that it has a transmission efficiency of at least 60%, since a person would be motivated to increase the signal-to-noise ratio by increasing the intensity of the x-ray beam used to analyze the sample.

*Conclusion*

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

(1) Bowen *et al.* (U. S. Pub. No. 2004/0089818 B1) disclosed a multi-foil optic.

(2) Kumakhov (U. S. Patent No. 6,678,352 B1) disclosed an anti-scatter x-ray collimator made of glass.

(3) Foster *et al.* (U. S. Patent No. 6,624,431 B1) disclosed a radiation collimator.

(4) Shimizu *et al.* (U. S. Patent No. 6,307,917 B1) disclosed a Soller slit.

(5) Reefman (U. S. Patent No. 6,108,401) disclosed a diffractometer comprising Soller slits.

(6) Kumakhov (U. S. Patent No. 5,744,813) disclosed a radiation collimator made of glass.

(7) Tosswill *et al.* (U. S. Patent No. 4,125,776) disclosed a radiation collimator.

(8) B. D. Cullity. Elements of X-Ray Diffraction, second edition (Reading, MA: Addision-Wesley, 1978), p. 196-199.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Art Unit 2882

12 January 2005